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16. ABSTRACT

This document describes the final emission inventory requirements related to preparation and submission of post-1987 carbon monoxide State Implementation Plans (SIPs) for those States required to revise their plans after December 31, 1987.

Discussed in the document are emission inventory requirements relating to geographic area of coverage, point source cutoff size specifications, sources to be included, data reporting formats, documentation requirements, quality of data base, years to be addressed, and schedule for inventory submission.

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EMISSION INVENTORY REQUIREMENTS FOR POST-1987 CARBON MONOXIDE STATE IMPLEMENTATION PLANS

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1.0 INTRODUCTION

On June 6, 1988, EPA proposed to designate as nonattainment under the Clean Air Act those areas throughout the Nation that had not attained the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (see 53 FR 20722). Subsequently, EPA Regional Administrators sent letters to the Governors of the affected States requesting that they or their designated local agencies develop schedules for compiling emission inventories needed as part of their State implementation plans (SIPs) (see 53 FR 34500, September 7, 1988). The EPA is requiring that the development of these inventories be initiated in advance of the finalization of the post-1987 ozone/CO policy because of the considerable time and effort needed to compile important components of the inventory [e.g., vehicle-miles traveled (VMT) data].

The specific requirements for the base year CO SIP emission inventories are contained in this document. General guidance and procedures for preparing CO emission inventories are contained in other documents which are listed in Sections 4 and 5 of this report. The requirements for the projection year inventory and the reasonable further progress (RFP) provisions are not currently covered in this document, but will be covered in a revision to this document to be issued at a later date.

2.0 EMISSION INVENTORY REQUIREMENTS

2.1 Pollutants

Carbon monoxide (CO) is the only pollutant that needs to be included in the CO SIP emissions inventory.

2.2 Base Year

The base year of the emissions inventory shall be 1987 or 1988. Once either of these years is selected, the emissions inventory for all sources shall be compiled for that year.

2.3 Geographic Area

Most areas will be required to prepare an inventory for the entire metropolitan statistical area or consolidated metropolitan statistical area (MSA/CMSA) in which nonattainment of the CO NAAQS was determined. Criteria for excluding whole counties or sub-county portions from the MSA/CMSA follow.

2.3.1 Exclusion of Whole Counties From MSA/CMSA

No county with measured or modeled CO violations may be excluded. Counties may be excluded if: (a) the level of outcommuting (workers residing in the county but working in other counties of the MSA/CMSA) does not exceed 10,000 and is not projected to exceed this level for at least 10 years, and (b) tney do not contain urbanized areas of at least 50,000 population and are not projected to contain urbanized areas of at least 50,000 in the next 10 years.

2.3.2 Exclusion of Sub-county Portions From MSA/CMSA

No sub-county with measured or modeled CO violations may be excluded. Sub-county portions may be excluded if: (a) the

average population density in the excluded area does not exceed 50 people per square mile and is not projected to exceed this level for at least 10 years, and (b) they do not contain urbanized areas of at least 50,000 population and are not projected to contain urbanized areas of at least 50,000 in the next 10 years.

Areas expecting to submit hot spot demonstrations will be required to provide an areawide inventory covering either the MSA/CMSA or the area remaining after applying the above exclusion criteria. Further discussion of hot spot demonstrations is given in the following section.

2.4 Hot Spot Demonstrations

Every CO violation can be thought of as having two components: a hot spot or microscale component, and an areawide or mesoscale component. Each of these components are treated differently in terms of emissions inventory, modeling and control strategy requirements.

A hot spot can be defined as a CO violation with an identifiable nearby source and a high contribution from the microscale component. A small town may have only one hot spot, such as a bridge or tunnel, while a larger city may have multiple hot spots, such as traffic congestion at numerous intersections.

State or local agencies may demonstrate attainment using only hot spot measures, only areawide measures, or a combination of areawide and hot spot measures. Attainment demonstrations relying mainly or exclusively on hot spot measures, where there is not a significant areawide contribution, must demonstrate that the problem

is caused or contributed to by hot spots and that the hot spot measures will provide for near-term attainment. This hot spot demonstration consists of an identification of hot spots, a modeling analysis, and a demonstration of attainment discussed further below.

Identification of Hot Spots. The entire MSA/CMSA or reduced area (see Section 2.3) must be analyzed to determine where the hot spots exist. Surrogate parameters such as average daily traffic (ADT) levels may be used to identify likely hot spots for further analysis.

Modeling Analysis. The analysis should employ both hot spot and areawide modeling to determine: (1) the number of hot spots exceeding the NAAQS, (2) the peak hot spot(s), (3) the levels of hot spots, (4) the areawide contribution, and (5) the effects of control strategies on projected hot spots. The EPA recommended model for hot spots is Worksheet 2 of the Guideline for Air Quality Maintenance Planning and Analysis, Volume 9 (Revised): Evaluating Indirect Sources[1] for determining emissions and traffic input to CALINE3 dispersion model.[2] The EPA recommended areawide models are the RAM Model[3] or Urban Airshed[4].

Demonstration of attainment. For control strategies relying on hot spot measures, the SIP must demonstrate attainment in the near-term which is defined as 4 years from SIP due date. If near-term attainment cannot be demonstrated with hot spot measures alone, areawide measures must be added.

If attainment cannot be demonstrated in the 4-year period, areawide measures must be added at a rate that would achieve 3 percent reduction per year of the adjusted areawide baseline CO inventory.

This annual reduction requirement starts in the base year. (See November 24, 1987, Federal Register proposal for the adjustment procedure and a description of the annual reduction requirement.)

Whether near-term attainment is demonstrated with hot spot measures only or a combination of hot spot and areawide measures, the hot spot measures must be implemented within the 4-year period. If near-term attainment is not feasible and long-term attainment is demonstrated, the hot spot measures may be implemented at any date prior to the attainment date, provided that the annual areawide 3 percent reduction requirement is met. Because hot spot measures affect limited areas, the State or local agency must demonstrate attainment for each hot spot identified.

As mentioned in Section 2.3, EPA will require an areawide inventory for hot spot demonstrations. An areawide inventory is needed to determine the areawide component of the hot spot violation. Also, as part of the hot spot demonstration, the State or local agency is requested to look beyond the hot spot to identify other potential hot spots and to determine the areal extent of high air quality levels. An areawide inventory would aid in this effort because in developing the inventory the Agency gathers information on speed, VMT, vehicle characteristics, etc. Also, projections of the areawide inventory would consider growth in VMT, changes in speed, etc. which should support the projections made regarding the areawide component of the hot spot. Therefore an areawide inventory is needed for hot spot demonstrations, as well as areawide demonstrations. Consequently, the remainder of this document will focus on areawide

emission inventory requirements. Specific requirements for hot spot analysis are contained in Worksheet 2 of the Guideline For Air Quality Maintenance Planning And Analysis, Volume IX (revised): Evaluating Indirect Sources.

2.5 Source Categories

Mobile sources and stationary point and area sources shall be included in the areawide emissions inventory. A separate discussion of mobile, point, and area sources follows.

2.5.1 Mobile Sources

Mobile sources consist of highway and off-highway vehicles. While highway vehicles are the major contributors to CO emissions, both highway and off-highway vehicles shall be included in the inventory.

Local traffic emissions, as well as major highway emissions, shall be included in the highway vehicle emissions inventory. The highway vehicle emissions shall be derived by multiplying vehicle-miles traveled (VMT) by MOBILE4 emission factors. The VMT shall be obtained by using procedures described in Chapter 4 of Procedures For Emission Inventory Preparation, Volume IV: Mobile Sources.[5] The base year for VMT data shall be 1987 or 1988. The MOBILE4 emission factors shall be obtained by applying the MOBILE4 model. The User's Guide to MOBILE4[6] describes how to use the MOBILE4 model and references other documents that provide guidance on how to develop inputs. The temperature input to MOBILE4 should be the average temperature over the time period that coincides with the 10 highest 8-hour non-overlapping CO monitored concentrations recorded in

the area over the most recent 3 years. Requirements for documenting the highway vehicle emissions inventory are contained in Section 3.1.1 of this document.

Off-highway vehicles that should be included in the inventory are aircraft, railroads, vessels, industrial equipment, construction equipment, and other sources unique to each geographic area (e.g., snowmobiles). Guidance for developing the off-highway vehicle emissions inventory is contained in Procedures For Emission Inventory Preparation, Volume IV: Mobile Sources.[5] Requirements for documenting the off-highway vehicle emissions inventory are contained in Section 3.1.2 of this document.

2.5.2 Point Sources

At a minimum, stationary sources (facilities) that emit equal to or greater than 100 tons per year (TPY) actual emissions of CO shall be included in the point source inventory. Smaller sources may either be included in the point source inventory or aggregated in the area source inventory, at the discretion of the agency compiling the emissions inventory.

The major point source categories of CO emissions are combustion and industrial processes. Specific types of sources to be included in these categories and procedures for inventorying them are contained in Procedures For Emission Inventory Preparation, Volume II: Point Sources.[7] Requirements for documenting this point sources emissions inventory are contained in Section 3.2 of this document.

2.5.3 Area Sources

Area sources include those stationary sources that

are too small and/or too numerous to be included in the point source emissions inventory. One such source category is residential fuel combustion including wood stoves and fireplaces. Area source emissions generally are estimated by multiplying an activity level, such as population, by an emission factor. A list of area source categories and procedures for inventorying these categories are contained in Procedures For Emission Inventory Preparation, Volume III: Area Sources.[4] Requirements for documenting the area source emission inventory are contained in Section 3.3 of this document.

2.6 Rule Effectiveness

Past inventories have assumed that regulatory programs would be implemented with full effectiveness, achieving all of the required or intended emission reductions and maintaining that level over time. However, experience has shown regulatory programs to be less than 100 percent effective for most source categories in most areas of the country. The concept of applying rule effectiveness (RE) in the SIP emission inventory has evolved from this observation. In short, RE reflects the ability of a regulatory program to achieve all the emission reductions that could be achieved by full compliance with the applicable regulations at all sources at all times.

Several factors should be taken into account when estimating the effectiveness of a regulatory program. These include: (1) the nature of the regulation (e.g., whether any ambiguities or deficiencies exist, whether test methods and/or recordkeeping requirements are prescribed); (2) the nature of the compliance procedures (e.g., taking into account the long-term performance

capabilities of the control); (3) the performance of the source in maintaining compliance over time (e.g., training programs, maintenance schedule, recordkeeping practices); and (4) the performance of the implementing agency in assuring compliance (e.g., training programs, inspection schedules, follow-up procedures).

Rule effectiveness shall be applied for stationary sources that are affected by a regulation and for which emissions are determined by means of emission factors and control efficiency estimates. No rule effectiveness factor is needed in cases where no control is applied or there is no applicable regulation. For mobile sources, rule effectiveness factors shall be considered and applied where appropriate. Information on applying rule effectiveness for specific mobile source controls are given below.

2.6.1 Transportation Control Measures (TCMs)

The TCMs are often designed to reduce certain activity levels such as VMT to a specified level or by a set amount. Since the base-year mobile source inventory relies on measurements or estimates of actual activity levels (including VMT, speed, etc.) occurring in the base year, the effects of TCMs already implemented will be taken into account in generating the inventory. Therefore, EPA will not require adjustment of the base year inventory to account for TCM effectiveness. However, EPA will require the expected reductions from future TCMs to be adjusted for effectiveness, because future strategies are subject to doubt as to whether the target VMT reductions or the underlying assumptions will actually be realized.

Emission reductions from future TCMs need to be adjusted for effectiveness much like any stationary source strategy.

2.6.2 Inspection/Maintenance (I/M) and Anti-tampering Programs

The effectiveness of I/M and anti-tampering programs will be considered in the base-year inventory, but not by applying an overall adjustment to the full effectiveness level. The MOBILE4 emission factor model contains an internal feature that adjusts for the effectiveness of the Federal Motor Vehicle Control Program (FMVCP) when a decentralized, manual inspection program is used. The model also requires local inputs for waiver rates and compliance rates. Operating data should be from the calendar year corresponding to the base-year inventory.

2.6.3 Fuels Programs

Fuels programs, such as local controls on volatility, should be adjusted for effectiveness because of a number of assumptions regarding market penetration, compliance, etc. associated with implementation of such programs. States should contact the EPA Regional Office for guidance on how to adjust the base-year inventory for the effectiveness of these programs.

2.7 Temporal Allocation

The degree of temporal allocation needed for the emissions inventory depends on the technique being used to demonstrate control strategies. The recommended techniques for control strategy demonstrations are the RAM Model[3] and the Urban Airshed Model,[4] although linear rollback is acceptable.

If linear rollback is utilized for control strategy demonstrations, emissions need to be temporally allocated to a representative weekday in the CO season (winter in most areas). Emission estimates for point, area, and off-highway mobile sources are frequently maintained on an annual basis in State and local inventories. These annual emissions should first be allocated to the months comprising the CO season. These are the months in which the highest CO concentrations occur in the area. The emissions should then be allocated to a representative weekday within the CO season.

Generally, highway mobile source emission estimates are determined for an average annual weekday by the responsible Metropolitan Planning Organization or State Department of Transportation. To develop an emissions inventory for a representative CO season weekday, emission estimates for the CO season can be used if available, or a seasonal factor can be applied to average annual estimates to adjust for increases or decreases in travel during the CO season. Adjustment factors can be derived from local traffic counting programs.

If a dispersion model is to be used for control strategy demonstrations, then hourly emission estimates for the representative weekday in the CO season will be needed for input to the dispersion model. Guidance on preparing a temporally resolved emission inventory for dispersion modeling is contained in Procedures For The Preparation Of Emission Inventories For Volatile Organic Compounds, Volume II: Emission Inventory Requirements For Photochemical Air Quality Simulation Models.' Although this document was prepared specifically

for temporal allocation of VOC emissions, the guidance is generally applicable to CO emissions.

2.8 Spatial Allocation

The degree of spatial allocation needed for the emissions inventory depends on the technique being used to demonstrate control strategies. Again, the recommended techniques for control strategy demonstrations are the RAM Model[3] and Urban Airshed Model[4], although linear rollback is acceptable.

If the RAM Model is used for control strategy demonstrations, mobile and area sources need to be allocated to square grid cells within the modeling domain that covers the geographic area of the inventory discussed in Section 2.3 of this document. The size of the grid cells used in the RAM Model can vary over the modeling, domain. The recommended grid square sizes are from 1 to 5 kilometers (km), with 1 km grid square recommended for the central business district (CBD) of urban areas and larger grid squares recommended for areas outside the CBD. Dispersion models such as the RAM model require that point sources be allocated to the exact location in UTM coordinates and that stack parameters (e.g., height, diameter, exit velocity, and exit temperature) be specified for input.

Guidance on preparing a spatially resolved emissions inventory for dispersion modeling is contained in Procedures For The Preparation Of Emission Inventories For Volatile Organic Compounds, Volume II: Emission Inventory Requirements For Photochemical Air Quality Simulation Models.[9] Again, although this document was

prepared specifically for spatial allocation of VOC emissions, the guidance is generally applicable to CO emissions.

The spatial allocation requirements for the Urban Airshed Model (UAM) are the same as those for the RAM Model with one difference. The difference is that the grid square size for allocation of mobile and area sources needs to remain constant over the modeling domain for the UAM. The recommended grid square size for UAM is from 2 to 5 kilometers. The choice of grid square size depends on the size of the area being modeled, the resources available for modeling, and the degree of resolution needed to determine the effects of a particular control strategy.

If linear rollback is utilized for control strategy demonstrations, a minimal spatial allocation of emissions is needed. An area choosing to use linear rollback shall report countywide mobile and area source emissions totals by source category, with point sources listed separately. Point source data shall include addresses of sources and emissions data. Further information on the requirements for point sources is given in Section 3.2 of this document.

2.9 Format

The SIP Air Emissions Inventory Management System [10] or an equivalent format should be used to maintain and report the emissions inventory. At a minimum, the temporally allocated emissions (see Section 2.7) shall be submitted on a countywide basis for each mobile and area source category contained in the inventory. Each point

source shall be listed separately and shall contain the point, plant, and segment information contained in Section 3.2 of this document.

2.10 Schedule

A complete base-year emission inventory is to be submitted to EPA in mid-November 1989, approximately one (1) year from the completion of the Workshops for Development of O_3/CO SIP Emissions Inventories. The final inventory which shall include any revisions or additions that result from the State's response to EPA's review and projections is due approximately two (2) years after EPA issues the post-1987 ozone/CO policy. Specific due dates shall be determined by the appropriate EPA Regional Offices after review of the schedules proposed by the States.

3.0 Documentation

The State or local agency preparing the emissions inventory shall provide EPA with a narrative report that documents the procedures, data, and assumptions that were used in compiling the base-year inventory. This shall be provided with the initial inventory submittal. In addition to the requirements for documenting the mobile, point, and area source inventories described in separate sections below, the report shall include the following.

- A description of the geographic area included in the inventory including documentation for any adjustments made to the original designated area. Documentation shall reference all sources of current or projected data, and include maps of subcountry boundaries for excluded areas.

- The base year of the emissions inventory (1987 or 1988).

- The population of the area, and the source of the population data.

- Procedures and results of the emission inventory quality assurance program.

- Procedures used to temporally allocate each source category (e.g., selection of the months comprising the CO season, seasonal variations in activity levels at sources, daily variation in activity levels, etc.).

- Procedures used to spatially allocate the emissions inventory. If a dispersion model will be used for control strategy demonstrations, a map of the geographic area with the modeling domain

and grid squares overlaid on top of it shall be included. The grid square sizes need to be indicated on the map.

3.1 Mobile Source Requirements

The narrative report prepared by the State or local agency should include documentation of the following components of the mobile source inventory.

3.1.1 Highway Vehicles

The model used to develop the necessary travel information and the transportation agency that ran the model. The name and phone number of the appropriate contact at the agency should be included.

- The year that the travel information was generated, the base-year of the VMT estimate employed to create the base-year inventory VMT estimate, and the procedure used to interpolate between them to create speed estimates. Identify the level of disaggregation (e.g., facility types) at which these calculations were developed.

- The data used to estimate 1987 or 1988 VMT from the base highway VMT. Discuss the method used, whether the traffic counts were facility-specific or other data were employed to create the 1987 or 1988 estimate. Identify the source and date of the data used to project VMT levels for all years.

- The road classifications used to develop the VMT and speed estimates in each of the inventory years. Note the VMT and speed estimates by facility type for each year in the inventory.

- The method and source used to develop an estimate of travel the occurred within the boundaries of the transportation planning area but was not included in the highway network estimate.

Note the percentage of total VMT that occurred off the highway network, but within the transportation planning area and the associated speed estimates for these VMT for each year in the inventory.

- The method and source used to develop an estimate of travel that occurred outside the transportation planning area, but within the boundaries of the emissions inventory area determined by applying criteria in Section 2.3 of this document. Note the percentage of the total VMT that occurred outside the transportation planning area, but within the boundaries of the emissions inventory area and the associated speed estimates for these VMT for each year in the inventory.

- The methods used to develop inputs to MOBILE4 and the actual inputs to MOBILE4, including speeds and temperature.

- The MOBILE4 outputs.

- The temporally allocated emissions.

3.1.2 Off-highway Vehicles

- Source categories included in the inventory.

- The methods used to estimate emissions for each source category, including the activity level and emission factor.

- The temporally allocated emissions.

3.2 Point Source Requirements

The following plant, point, and segment information is required. In addition, if a dispersion model is being used for control strategy demonstrations, Universal Transverse Mercator (UTM) zone, UTM coordinates, and stack parameters shall be documented.

3.2.1 Plant Information

- National Emissions Data System (NEDS) ID: (State, County, Plant)
- Name, Address, City, Zip Code
- Standard Industrial Code (SIC) Code
- Principal Product

3.2.2 Point Information

- NEDS Point ID
- Point Description
- Operating Schedule

3.2.3 Segment Information

- Standard Classification Codes (SCC)
- Process Rates (units)
- Control Equipment
- Control Efficiency
- Emission Estimation Methods
- The temporally allocated emissions

3.3 Area Source Requirements

- Source categories included in the inventory.
- The methods used to estimate emissions for each source category, including the activity level and emission factor.
- The temporally allocated emissions

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